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November 20, 2009

The Honorable Janet Napolitano
Secretary
U.S. Department of Homeland Security
Washington D.C. 20528

Dear Secretary Napolitano:

Earlier this week, at a hearing by the Subcommittee on Investigations and Oversight, the Subcommittee members learned that the Department's three-year attempt to install a new generation of radiation detection monitors at the nation's ports and borders was indefinitely on hold because of a dire shortage of helium-3. According to Dr. William Hagan, acting deputy director of the Domestic Nuclear Detection Office (DNDO), currently no helium-3 will be used for radiation portal monitor purposes.

Dr. Hagan said that the demand for helium-3 exceeds supply by a ratio of ten to one, and that it was likely an alternative would have to be found.[1] Helium-3 is an essential component of all radiation monitoring devices as it detects the neutrons that are part of the special nuclear material that the devices are designed to discover.[2] DHS had received plenty of signs in the past year that the lack of helium-3 could be a show-stopper for the Advanced Spectroscopic Portal (ASP) program. The Pacific Northwest National Laboratory (PNNL) issued a report last April concluding that because of the increased demand for helium-3 for homeland security applications, the supply could no longer meet the demand.[3] In June, PNNL issued a second report in which it told DNDO in no uncertain terms that "[b]ecause of the imminent shortage of ^{3}He . . . a replacement technology for neutron detection is required in the very near future."

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[1] Testimony of Dr. William Hagan, acting deputy director, Domestic Nuclear Detection Office, Department of Homeland Security, before the Investigations and Oversight Committee, House Science and Technology Committee, November 17, 2009.

[2] It is also used in magnetic resonance imaging and low-temperature physics, such as superconductivity and superfluidity. It is used at the Energy Department's Spallation Neutron Source facility and in nanotechnology and quantum computing.

[3] Pacific Northwest National Laboratory, "The ^{3}He Supply Problem," April 2009, PNNL-18388, p. 1. The major source of helium-3, which is a byproduct of the radioactive decay of tritium has been the tritium cleaning process conducted at the National Nuclear Security Administration's Savannah River site. The tritium is used in nuclear weapons from both the U.S. and Russia. The amount of tritium required has decreased as the weapons stockpile has decreased. *Ibid.*, pp. 1 and 4.

Additionally, DNDO would have to test each of the currently available technologies to see if they had the "appropriate capabilities" to replace helium-3.[4] This process could take a number of years since none of the alternatives "meet the performance capability of ^{3}He for neutron detection, and there are no existing alternatives that combine all the capabilities of ^{3}He."[5]

In a recent statement, Dr. Hagan said the "focus" was on boron triflouride (BF_3) as an alternative, but PNNL has found that BF_3 detectors – which were the first commercial radiation detectors – are much less sensitive to neutrons and have many other problems including restrictive transport rules as a toxic gas.[6]

This may be an opportunity for the Department to use the helium-3 crisis as an off-ramp for this troubled program. I encourage you in the strongest possible terms to look long and hard at the ASP program as it is now conceived. For far less money, and far less demand for helium-3, the Department of Homeland Security (DHS) could be realizing gains in the performance of both the already deployed polyvinyl toluene (PVT) monitors and the handheld radiation detectors that Customs and Border Protection (CBP) uses in secondary inspections. PNNL has received a very small research contract (less than $2 million) from DHS to work on algorithms to increase the performance of PVTs through energy windowing. PNNL has issued a report concluding that existing algorithms could make modest improvements in PVT performance and more advanced algorithms could be developed that would let the PVTs match the performance of ASPs.[7] That seems like a sensible, cost-effective way to shepherd our helium-3 stores – since the PVTs are already built and deployed – while making the country safer.

The Subcommittee has been examining DNDO's management of the ASP program with increasing concern over the past three years. In retrospect, what is most surprising is that DHS ever gave the green light to go forward with an ASP program that was always designed as an acquisition program rather than an authentic research program. The physics of the ASPs only promised at best a very marginal increase in detection capability – and only for some isotopes – over the much cheaper and field-proven 1,400 PVT monitors already deployed around the country. This marginal improvement would only come against very unlikely scenarios involving special nuclear materials that were lightly shielded. Even modest enhancements to shielding would defeat the detection abilities of either PVTs or ASPs, and DHS leadership knew that.

Despite these obvious limits, your predecessor announced contracts for more than $1 billion to purchase ASP units in July of 2006, well before any actual testing had taken place. [8]

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[4] PNNL, "Radiation Portal Monitor Project: Alternative Neutron Detector Technologies for Homeland Security," June 9, 2009, PNNL-18471, executive summary.
[5] Kouzes, R., Pacific Northwest National Laboratory, "The ^{3}He Supply Problem," April 2009, PNNL-18338, p. 8.
[6] "U.S. Government Agencies Work to Minimize Damage Due to Helium-3 Shortfall," Physics Today, October 2009, p. 22 for Hagan quote. Van Ginhoven, Louzes and Stephens, PNNL, "Radiation Portal Monitor Project: Alternative Neutron Detector Technologies for Homeland Security," June 9, 2009, PNNL-18471, pp. 7-8.
[7] PNNL, "PNNL Position Paper on the Application of Spectral Analysis Algorithms to Spectroscopic PVT Sensors for Threat Detection in Vehicle Screening: Energy Windowing and Advanced Algorithms," November 13, 2009, PNNL-18991.
[8] "Remarks by Homeland Security Secretary Michael Chertoff and DNDO Director Vayl Oxford at a Press Conference to Announce Spectroscopic Portal (ASP) Contracts," DHS press release, July 14, 2006.

Since then, the tests that have been run have shown that the detectors simply do not perform as advertised with many more false positives than expected, and the estimated cost for deploying the ASPs has climbed above $2 billion – without factoring in new costs associated with the escalating price of helium-3.

In the July 2009 field tests, the ASPs showed a disturbing tendency to report uranium was present in cargo when no isotope of any kind was present. This kind of false positive – identifying phantom isotopes – is far different from the typical "nuisance alarms" of the PVTs where innocent isotopes normally present in such products as granite and kitty litter lead to a secondary inspection. The "fix" DNDO offers for eliminating phantom isotopes – to reduce the sensitivity of the instruments to uranium – raises hard questions about whether the detectors even retain their marginal improvement level over the PVTs.

There is no apparent justification for the ASP effort to go through all the remaining hoops when a disastrous end point – an $800,000 device that does not provide real improvement in detection or in Customs' functions and cannot be built as designed because of a lack of helium-3 – appears unavoidable. It is hard to understand why the Department allowed the July field tests to go forward when someone in the Department must have known the system being tested could never be deployed. It is inconceivable that the Department would spend still more money, and more of the valuable time of the CBP, on a third effort to get this cursed project through field validation testing – though the Subcommittee was told that was the Department's plan.

Please consider making the ASP program become the small research program it should probably always have been. In conjunction with the Department of Energy, use it to test alternative approaches to neutron detection that do not require helium-3. Then put the Department's resources into achieving greater efficiency in the detectors already deployed. The reconfiguration of the DHS radiation detection program provides one of those rare opportunities to save money while doing what is needed.

Sincerely,

BRAD MILLER
Chairman
Subcommittee on Investigations & Oversight

CC: HON. PAUL BROUN
Ranking Member
Subcommittee on Investigations & Oversight